STUDIES ON THE ACTION OF STREPTOMYCIN

BY

ESTHER IONE RHYMER

B.Ed., Illinois State Normal University, 1940
M.S., University of Illinois, 1945

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN BACTERIOLOGY
IN THE GRADUATE SCHOOL OF THE
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STUDIES ON THE ACTION OF STREPTOMYCIN

Since the promulgation of the principle of microbic association by Pasteur (3) in 1863 numerous investigations of this type have been made. Historically, this subject has been reviewed thoroughly by Waksman (5, 6, 7). In 1944 Schatz, Bugie, and Waksman (4) reported the discovery of streptomycin, an antibacterial agent predominantly effective against Gram negative organisms. Hobby, Lenert, and Hyman (2) have observed that impure preparations are bacteriostatic in action causing either a decrease in the number of organisms present or at least inhibition of multiplication of the organisms, and that true bactericidal action is seldom observed especially among the enteric organisms. According to Hamre, Rake, and Donovick (1) streptomycin "in vitro" has bactericidal action on both young growing and resting cells of susceptible organisms. The present investigation was undertaken in an attempt to determine the action of the bactericidal and bacteriostatic action of streptomycin.

Although a considerable volume of research has been done to elucidate the mode of action of antibiotics, there is insufficient data to formulate a rational hypothesis. Much has been accomplished however toward defining the conditions under which maximal antibacterial effect is achieved.

Published information pertaining to the mechanism of action of streptomycin may be classified into four groups.

1. that which relates to the difference in sensitivity of different strains of the same species.
2. that which shows evidence for morphological changes as a result of exposure to streptomycin.
3. that which shows the effects of enhancers and inhibitors.
4. that which relates the effect of streptomycin to conditions of bacterial growth.

The action of streptomycin and the effect of culture medium using *Eberthella thyphosa* (Hopkin's strain) and *Staphylococcus aureus* (F. D. A. 209) was studied. Forty four media were used. Some of these were complete standard media, others were standard media with one constituent either added or left out. The liquid dilution method was the test procedure. Bacterial plate counts, and the presence or absence of turbidity were used to determine the action of streptomycin.

Antibacterial activity of the streptomycin was observed to be reduced or abolished in some of the media. This suggested that one or more specific chemical substances might be responsible for the neutralizing effect. Therefore a study was undertaken together with an attempt to isolate the substance(s).

The neutralizing effect of the substance(s) on the streptomycin was shown by the considerably larger amounts of streptomycin required for inhibition in the presence of the supplement than in the supplement free control.

Inhibition of bacteria with streptomycin was found to be easier in a poorer medium than in a good medium. Inhibition was not dependent upon rapidly growing bacteria. Vitamins were found to have no effect on the action of streptomycin. Phytone, a plant peptone, liver fraction L, and brain heart infusion were sources of an interfering action of streptomycin. The competitive effect of streptomycin and the streptomycin interfering substance perhaps is an explanation for the effect of streptomycin on sensitive bacteria.

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